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Indian Standard

**METHOD FOR DETERMINING
RESISTANCE TO PENETRATION BY WATER
OF FABRICS BY STATIC
PRESSURE HEAD TEST**

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

METHOD FOR DETERMINING RESISTANCE TO PENETRATION BY WATER OF FABRICS BY STATIC PRESSURE HEAD TEST

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Indian Standard

METHOD FOR DETERMINING RESISTANCE TO PENETRATION BY WATER OF FABRICS BY STATIC PRESSURE HEAD TEST

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 12 March 1976, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 Water passes through water-resistant fabrics by:

- a) penetration through their interstices under its own or applied pressure (The resistance offered by fabrics to this action is influenced mainly by their construction or structure.);
- b) wetting of one side of the fabrics followed by capillary action, which brings the water to the other side and wets it (The resistance offered by fabrics to this action is influenced mainly by their water-repellency.); or
- c) combination of (a) and (b).

0.3 A number of test methods have been developed for testing waterproofness, water-repellency and water-resistance of fabrics, like spray test, hydrostatic head test, static pressure head test, Bundesmann test and cone test. All these test methods are prevalent in industry and trade. However, the use of a particular test depends upon the type of fabric under test and its end uses. So far no correlation has been established between the results of different test methods and hence their results are not comparable.

0.4 The static pressure head test prescribed in this standard is a relatively simple test and gives a good indication of the effect of fabric structure on resistance to penetration by water of fabrics. The resistance by a fabric to penetration of water is measured in terms of the amount of water penetrating through the fabric per unit area per unit time under a static head of water.

0.5 In reporting the result of a test made in accordance with this standard,

if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for determining resistance to penetration by water of fabrics by static pressure head test. It is applicable to fabrics non-permeable to air.

2. PRINCIPLE

2.1 A circular specimen of the fabric is mounted horizontally and water is forced through the specimen from upper side under static pressure. The volume of water collected in a given time is expressed in terms of the volume of water penetrated per unit area of the fabric per unit time ($l/m^2/h$).

3. SAMPLING

3.1 Samples shall be so drawn as to be representative of the lot. Samples drawn in compliance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot. In case of cotton fabrics reference to IS : 5463-1969† shall be made.

4. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

4.1 The test samples shall be conditioned in accordance with IS : 6359-1971‡ except in case of fabrics heavier than 270 g/m^2 for which the minimum conditioning period shall be 48 hours.

4.2 The tests shall be carried out in standard atmosphere (see IS : 196-1966§).

5. PREPARATION OF TEST SPECIMENS

5.1 From each test sample prepare circular test specimens of 13 cm diameter from different portions at random. Prepare at least 3 test specimens.

6. EQUIPMENT

6.1 Means for:

- a) clamping the specimens with a circular test portion of 10 cm diameter,

*Rules for rounding off numerical values (*revised*).

†Methods for sampling of cotton fabrics for chemical tests.

‡Method for conditioning of textiles.

§Atmospheric conditions for testing (*revised*).

- b) applying the required static water head pressure and maintaining the pressure throughout the test, and
- c) collecting penetrated water without any loss.

6.1.1 A typical equipment is detailed in Appendix A.

6.2 Water — having pH between 6 and 8.5 and total hardness not exceeding 50 ppm, maintained at the temperature of testing atmosphere (see 4.2).

7. PROCEDURE

7.1 Adjust the water pressure head level to the required height. Place the container for collecting penetrated water in position. Open the water supply to the apparatus and note the time. Maintain the water level height for 1 hour.

7.2 After 1 hour, immediately remove the water container used for collecting penetrated water and determine the volume of water collected in litres.

7.3 Similarly carry out the test for other test specimens.

8. CALCULATION

8.1 From the volume of water collected as in 7.1 and 7.2 calculate the rate of water penetration (water resistance) in terms of litres per square metre per hour as follows:

$$\text{Rate of water penetration, l/m}^2/\text{h} = \frac{\text{Volume of water collected in litres} \times 100 \times 100}{3.14 \times 5 \times 5}$$

$$= \frac{\text{Volume of water collected in litres} \times 400}{3.14}$$

8.2 Determine the average of all the observations.

9. REPORT

9.1 The report shall include the following information:

- a) Type of the fabric,
- b) Number of specimens tested,
- c) Static water pressure head in millimetres, and
- d) Rate of water penetration in litres per square metre per hour.

APPENDIX A

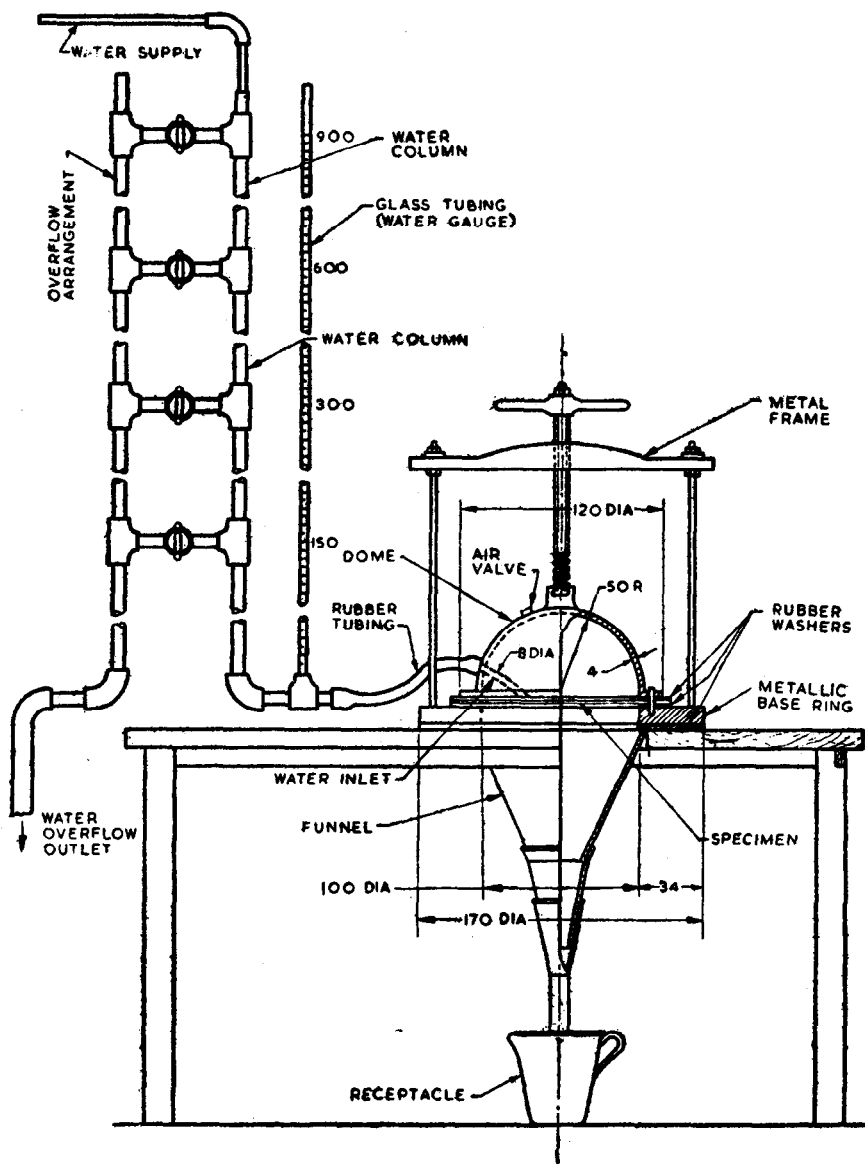
(Clause 6.1.1)

STATIC PRESSURE HEAD TEST APPARATUS**A-1. DESCRIPTION OF THE EQUIPMENT**

A-1.1 The apparatus (*see* Fig. 1) consists of a metallic base ring with an internal diameter of 10 cm (for holding the specimen), and a metallic dome of diameter 10 cm at the base provided with a water inlet and an air valve. The dome is fitted in a metal frame, so that the dome can be moved up and down or firmly fixed over the base ring. A funnel is fitted under the base ring. To collect water leaking through the specimen, a receptacle is provided. A gauge is attached to the water column for measuring the height of the column. The water column is connected to the water inlet on the metallic dome by means of a rubber tubing. The apparatus is also provided with an overflow arrangement (to regulate overflow) and an overflow outlet.

A-2. OPERATION

A-2.1 Clamp the specimen under test tightly between the base ring and the dome with the help of rubber washers. Open the water supply and fill the dome with water, taking care that all entrapped air is removed by permitting a little quantity of water to come out of the air valve. When the dome is full of water, close the valve and let the water rise in the water column to the required height (depending upon the type of fabric). Immediately, place the receptacle under funnel. Maintain, for 1 hour, the water column at the required height by adjusting the overflow arrangement. Immediately after 1 hour, remove the receptacle from under the funnel, and drain off the water in the dome by disconnecting the rubber tubing. Determine the volume of water which has collected in the receptacle in litres.



All dimensions in millimetres.

FIG. 1 A TYPICAL STATIC PRESSURE HEAD TEST APPARATUS

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